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GIGANTISM AND LEONTIASIS OSSEA, WITH REPORT OF
THE CASE OF THE GIANT WILKINS.

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The clinical features of this case have been studied by a number of prominent men both in this country and Europe in the course of the past ten years. So far as I know, the first description of the case was given by Dana, in 1893, in an article entitled: "On Acromegaly and Giantism with Unilateral Facial Hypertrophy." (13.) He first reports a case of acromegaly in an Indian 6 ft. 7 in. tall, then in introduction to this case remarks:

"The following case seems to be very apposite in this connection, because together with a gigantic general growth, there is a special hypertrophy of part of one extremity. It might be called a case of somatomegaly, a name suggested to me by Dr. Frank P. Foster, with a hemiacromegaly of the head. In plainer language, the individual is a professional giant with an enormous special development of one-half of the face."

Dana's description is as follows: "Lewis Wilkins, aged nineteen, single; occupation, freak; was born in Minnesota. His father was a native of New York; his mother, of Canada of English stock. His parents were healthy people of average size. He has six brothers and sisters, all of ordinary height. He was the second child. He was always large for his age, though not

remarkably so. He grew steadily, however, until by the age of seventeen he was over seven feet. He is now nearly twenty years old, and has grown one and a half inches in the last year. His present height is seven feet four inches, his weight three hundred and twenty-five pounds. His general proportions are for the most part good, but his feet and hands are particularly enormous, and the left side of the face shows a remarkable osseous hypertrophy, involving the frontal bone, upper and lower jaws. The hypertrophy corresponds closely with the distribution of the left trigeminal nerve. It gives his face a curious twisted and asymmetrical look, which is shown imperfectly in the photograph. The first impression is that he has a right hemiatrophy of the face. Closer inspection reveals, however, an enormous thickening of the left upper alveolar processes. The bone bulges out above the teeth as though he had a gumboil. The palatal arch is also greatly enlarged on the left side. The lower jaw is less affected, but is larger and longer on the left side. The teeth are white and even, and are not enlarged. The orbits are alike, but the left brow, and, indeed, the whole frontal bone bulges out so as to give a curious deformity to the skull. The thickening reaches back as far as the coronal suture and stops there. The head in brief is large, measuring 65.5 cm. in its greatest circumference. The osseous hypertrophy makes the naso-bregmatic arc very large, vis., 18.5, while the binauricular arc, measured through the bregma, is relatively smaller, as it does not go over the hypertrophied area. The measurements are: Greatest circumference of head, 65.5 cm. (25 $\frac{3}{4}$ in.); naso-occipital arc, 43 cm. (17 in.); naso-bregmatic arc, 18 cm. (7 $\frac{1}{2}$ in.); binauricular arc, 37 cm. (14 $\frac{1}{2}$ in.); from angle of jaw to symphysis of chin, right side, 13 cm. (5 $\frac{1}{8}$ in.), left side 18 cm. (7 $\frac{1}{8}$ in.), a difference of 2 inches. The circumference of the chest at the mammary line was 47 $\frac{1}{2}$ in. and the expansion 3 inches. This shows that he has a thorax of not excessive size proportionately. It is a good deal smaller than that of the Indian giant, whose height was 6 ft. 7 in. and whose chest measured 50 in. The hands were enormous, measuring 26 cm. (10 $\frac{1}{4}$ in.) from the tip of the middle finger to the process of the ulna; the circumference of the open hand around the middle of the palm, 27 cm. The feet are relatively still larger. He wears a shoe just a foot and a half long, while the actual total length of each foot is 35.5 cm. (14 in.), and the circumference around the instep is 29.2 cm. (11 $\frac{1}{2}$ in.). There is no especial asymmetry of physique except in respect to the face, as described. The left shoulder, however, is a little higher; he is decidedly round-shouldered, and there is a slight dorsolumbar lateral curvature of the spine. He has no cutaneous eruptions, no pigmentation or discoloration. He

has thick, coarse hair, but no beard. His muscular system is but moderately developed; the grasp of his hand is weak; he does not like to climb stairs; he has not much strength. He has good co-ordination; is a good shot. His knee-jerks are slow and feeble. Vision is good in both eyes, and he has no contraction of the visual field. The pupils react normally. The eyes are small, the palpebral fissure measuring 3 cm. His intelligence is good. He sleeps well and eats well. He has a prodigious appetite, and on one occasion ate 27 plates of ice cream at one sitting, thereby winning a wager that he could eat more than two men. No unpleasant after-effects were reported. He has slight headaches at times. His pulse beat and respiration and his heart action were normal. I could not say whether the thyroid was changed in size. It is certainly present." Dr. Dana, in conclusion, remarks: "The interest of this case lies first in the giant growth, and next in the progressive facial hemihypertrophy. That gigantism is sometimes associated with acromegaly has been shown by my own case and that of others cited. This patient has some symptoms belonging to acromegaly, viz., the enlargement of the bones of the left side of the face, beginning at about puberty, the kyphosis and scoliosis, the enormous feet, the coarse hair, feeble muscular development, and prodigious appetite. The progressive facial hypertrophy is very interesting on account of its rarity and its association with gigantism."

On April 24, 1896, Mr. Wilkins was presented to the Vienna Medical Society by Lamberg. The proceedings as given by the *Wiener klinische Wochenschrift* (29) were as follows:

"Lamberg presented Wilkins. The man, age twenty-two years, has healthy parents. Growth was normal until the fourth year. Then he grew rapidly until the sixteenth year. At eighteen he reached the present height, 245 cm. He is 20 cm. taller than the giant skeleton in the Vienna Anatomical Museum. He presents some skeletal abnormalities, viz., scoliosis, asymmetry of the pelvis, and a tumor of bony hardness, originating from the left upper jaw, which perhaps also causes a narrowing of the left nasal cavity. There is also considerable swelling of the left half of the forehead. The intelligence is proportionate to his age. The genital functions are normal. Lamberg considered the case as one of acromegaly.

"M. Sternberg: Only three skeletons in museums are larger, the Irish giant at Dublin (259 cm.), one at St. Petersburg (254 cm.), Patrick O'Byrne, London (249 cm.). Giants frequently present morbid features, general dystrophies or vegetative disturbances. About 40 per cent have acromegaly. Doubtless there are

also quite normal giants. He does not consider Wilkins a case of acromegaly. The prominence of the lower jaw is lacking as well as deformities of the soft parts of the mouth and nose; the tongue is normal, the hands are proportionate, etc. Abnormal is the great development of the left half of the face. The lips are also somewhat thickened on the left side, so we may speak of a hemihypertrophy facialis, principally ossea. The deviation of the axis of the left eyeball and the narrowing of the left nasal cavity point to bony changes in the orbit, and the slowness of movements and phlegmatic temperament to intracranial hyperostoses and exostoses. Buhl's case, Hassler, is probably the most analogous of the known cases.



Fig. 1 Mr. Wilkins and his brother.

"Schlesinger accentuated that acromegaly was clinically sufficiently sharply limited to exclude this case. Above all, the enlargement of the soft parts, almost always present in acromegaly, was lacking. The lips and tongue are approximately normal. So is the position of the teeth, which is almost always altered in acromegaly on account of the enlargement of the lower jaw. Schlesinger asked about the eye findings, as ocular disturbances are frequent in acromegaly, such as bitemporal hemianopsia, optic atrophy and paralysis, due to the frequency of hypophysis tumors.

"Lamberg: 'The eye findings are normal.'"

In his exhaustive treatise in Nothnagel's "Spec. Pathologie,"

Sternberg (43) again discusses this case and groups it together with Buhl's and one of Sirena's as "pathological," non-acromegalic gigantism, the "pathological" features in this group being tumor-like exostoses (leontiasis ossca and hyperostoses). In connection with leontiasis he says (p. 86) : "If the disease is extensive and associated with gigantism, a confusion with acromegaly is likely, as actually happened in the case of the giant Wilkins (Lamberg). Here was to be considered that the enormous hands and feet were proportionate to the excessive size of the body, and that a close examination showed the presence of bone tumor, with absence of acromegalic changes of bones and soft parts."

Schmidt, in his treatise on gigantism (41) takes the same view of the case, being positive that this case is not one of acromegaly, but analogous to that of Buhl. The latter case will be considered in detail later.

Mr. Wilkins was admitted to the service of Professor Bevan at the Presbyterian Hospital, June 28, 1902. The writer wishes to thank Professor Bevan for his kindness in allowing him to use the following history, which was obtained by the interne, Dr. Pearsall :

Lewis Wilkins, age 28. Family history: Father, age 55; mother, age 60; both well. Four brothers and one sister alive and well. All relatives and ancestors, so far as known, have been of normal stature. No history of tuberculosis or tumors in the family.

Personal—Patient weighed 9 pounds at birth, and was normal in size until four years of age, when he began to grow rapidly, and at ten years was over 6 ft. in height, and continued to grow until about 18, when he attained his present height (8 ft. 2 in.). He has been on exhibition the past twelve years, and has traveled extensively in the United States and Europe.*

Usual diseases of childhood. Malaria one year ago. Lateral curvature of spine for about twelve years. When eight years old he noticed a growth, size of a small marble, above the left eye. This has continued to grow slowly until four or five years ago, since which time he thinks it remained stationary until three months ago, from which time it has increased in size rapidly. About two years ago, he states, he saw Professor Virchow in Berlin, who, so he says, pronounced the growth a benign one, said it was on the external surface of the skull

*In a pamphlet distributed at Mr. Wilkins' exhibits in Germany it is stated that he did not grow in height from the age of 18 to 21, but gained 3 inches from 21 to 22, when he reached 245 cm. It is also stated that his father measured 161 cm., his mother 170 cm. in height.

and would probably never cause him trouble. Gonorrhea four years ago, discharge lasting about three weeks; denies other venereal infection. Three months ago he would have severe pain in left frontal and temporal region each morning on rising, pain disappearing gradually by 10-11 o'clock. For the past month he has had continued pain in this region when awake and has required the constant use of opiates. About one month ago he lost the vision in the left eye. Thinks it has been weak for several years. One week ago he also lost the sight in the right eye. Says vision disappeared suddenly; saw dimly on retiring one evening and the next morning could not appreciate light. He has had several spells of vomiting during this time. These spells have not been closely connected with eating. He states that he has had no sensation over the left side of the face for about one month, and during this time has had difficulty in speech, his voice being thick and heavy. Two months ago he experienced ringing sensations in the left ear and has since complained of earache. Says he is deaf in the left ear. Since his arrival at the hospital he has been dull; almost semi-stuporous. Has had several involuntary bowel movements. He was taken with diarrhea while on the way to Chicago from his home in Oklahoma.

Physical Examination. Height 8 ft 2 in., according to statement of patient. Measures 56 in. around the chest. He is well proportioned. There is a growth on the left side of the head which extends from the median line outward and backward as far as the external auditory meatus and downward over the face to the alveolar process of the superior maxilla. This mass is firm except in an area a little larger than a silver dollar in front of and above the external auditory meatus which is soft and semi-fluctuating. The left eye is closed. The left upper lip is thicker than the right and droops. The pupils react neither to light nor distance, and the left eyeball is immobile. The tongue does not deviate on protrusion, and the muscles on both sides act in frowning or laughing. There is an area of anesthesia extending from the left ramus of the lower jaw to the external auditory meatus, and upward to the median line of the skull. The left half of the tongue is also devoid of sensation except for a narrow strip near the median line. 6-28, urine 1027. Acid. No albumin or sugar. No casts. Red cells and leucocytes present. 6-28, blood examination, hemoglobin 85 per cent; reds, 4,876,000; leucocytes, 9,300. Temp., 98.4-101.4; pulse, 80-92 on day of admission. 7-1, urine, 2,400; cc., 1,010, ac. No albumin or sugar. Urea, 1.75 per cent; temp., 98-100. Ophthalmoscopic examination showed a bilateral choked disc.

The diarrhea became more severe while in the hospital, the

stools were slightly bloody, pain and tenesmus were present. He gradually failed, and died July 10, 1902.

The autopsy was held immediately after death by Professor Hektoen, assisted by Dr. L. Loeb and myself. A relative who was present did not permit any measurements to be taken. Fortunately those taken by Dana nine years ago give us the relative proportions. A growth in height has undoubtedly taken place since that time, as Lamberg's measurements and the patient's statements show; also an increase in the circumference of the chest. The time allowed for the autopsy did not permit a more detailed description of the external appearance of the body than that given in the clinical notes.

After the removal of the thoracic and abdominal viscera both carotids were injected with 4 per cent formaldehyde solution in order to harden the brain *in situ*.

Anatomic Diagnosis.—Necrotic and ulcerative colitis and ileitis; cirrhosis of liver; chronic catarrhal gastritis; epitheliosis of esophagus; hemorrhagic broncho-pneumonia (right lower lobe); enlargement of thyroid; sarcoma in region of hypophysis; extension of tumor to subcutaneous tissues; diffuse hyperostosis of frontal, left parietal, left temporal, and left superior maxillary bones; calcification of left pleura and spinal arachnoid; compression of brain; general gigantism.

The abdominal cavity is empty and the peritoneum smooth and free from adhesions. The diaphragm reaches to the fourth interspace on both sides.

Both pleural cavities are empty and there are no pleural adhesions, except between the right upper and middle lobes.

The pericardium is smooth and the cavity contains no fluid.

The thyroid weighs 112 grams: it is uniformly enlarged, and glistening on the cut surface as if the follicles were dilated with an unusual amount of colloid material. In the left lobe are two small, circumscribed, somewhat reddish nodules.

There is no trace of the thymus in the corresponding fatty masses.

The larynx and trachea show no changes.

The lungs are crepitant throughout, much lighter and spongier than usual, especially in the case of the left lung. In the lower right lobe are two hemorrhagic areas with elevated bases, the longest diameter being 6 cm. In the pleura over the lower left lobe is a flattened calcareous district, 1 cm. square, and at the right of the left lung are calcareous glands.

The heart is normal in shape and weighs 465 grams. There are no changes in the endocardium. The myocardium is firm and reddish brown.

The aorta is quite smooth throughout its entire extent.

The spleen is large and its capsule smooth. Cut surface is reddish and of normal appearance. The spleen weighs 620 grams.

The lymph nodes in various parts of the body are not enlarged.

The pharynx is normal.

The esophagus shows a number of flattened, whitish, firm, raised, nodular areas in the upper part of its course, generally arranged somewhat linearly. Otherwise the membrane is smooth.

The stomach is very large. It weighs, including the duodenum, 655 grams. The mucous membrane is thrown into huge wrinkles, not unlike cerebral convolutions, which cannot be straightened out on stretching the muscular coats. The mucous surface is covered with a turbid, tenacious mucus.

The small intestine from the duodeno-jejunal junction to the ileo-cecal valve, measures 20 meters in length. The mucosa is normal in appearance until within about 50 cm. of the valve, where it appears granular, rough, and of a dirty greenish yellow color in areas, with rather superficial small ulcers. Just above the ileocecal valve the entire circumference of the ileum, for about 5 cm., is intensely necrotic.

The large intestine is very voluminous; it measures in length, approximately, 4 meters. Its entire mucous membrane from the ileo-cecal valve to the anus is the seat of necrosis in the form of grayish, dirty, granular points and areas, and more especially of thickly disseminated, rather small ulcers with smooth floors as a general rule, and overhanging margins. In many cases the undermining of the margins is so extensive that large submucous tunnels are formed and neighboring ulcers may communicate with one another by means of these passages. In the flexures, and especially in the rectum, congestion of the mucous membrane is noticed.

The liver is large, weighing approximately 4,000 grams; it has a granular and nodular surface, especially near the lower margin of the right lobe. There is some increase in consistency and more or less distinct breaking up of the surface into large islands of liver tissue by fibrous bands. The under surface of the liver shows anomalous formation of the lobes, the right being taken up largely by a large projecting mass with some constriction at the base of its junction with the main part of the liver.

The gall bladder and bile passages do not show any changes.

The pancreas is large, weighing 275 grams; it is normal on the cut surface.

The adrenals are large, weighing 42.5 grams; they do not show any changes on the cut surface.

The kidneys also are large, weighing together 525 grams.

Capsule is free except over a rather large area in the left kidney, where there is an irregular, radiating, depressed scar. The surface is, in general, smooth. The cortex is unusually wide; the cortical markings distinct, and the glomeruli visible as reddish points. In the apices of several pyramids are small deposits of a granular, sand-like material.

The mucous membrane of the ureters and of the bladder is smooth. The bladder is distended with urine and is very large.

The prostate is not as large, in proportion, as other organs. The same seems to be true of the seminal vesicles and testicles, the latter weighing 85 grams.

There is a soft subcutaneous nodule almost as large as a fist



Fig. 2 Outer surface of skull-cap.

behind the left ear; and another of greater firmness involving about two thirds of the left side of the forehead. The tumor tissue on section is pink and homogeneous. The frontal region of the skull is very thick, especially on the left side. The skull cap weighs 1,450 grams; it is 68 cm. in circumference, 25 cm. in length; from the obliterated interfrontal suture, lower end, to the right coronal suture, internal horizontal measurement, is 5.7 cm.; from the same point to the left coronal suture is 8.5 cm. In the median line the frontal bone is 8.5 cm. thick, and is softer than normal, especially on the left side. There is marked asymmetry, the interparietal suture being displaced to the right. Fissures for vessels are relatively shallow. In front of the coronal suture the

bone is rough from the presence of thickly-set depressions, varying from 0.5 to 3.0 mm. in diameter. The remainder of the skull cap is smooth. The thickness varies from 2 to 8 mm. On the outside the interparietal suture presents a prominent ridge in its posterior half (see photograph). The parieto-occipital suture is also prominent. The base of the skull is greatly deformed. On the left side the anterior fossa is obliterated by the thickened frontal bone, and the middle fossa also is almost filled in with bone.



Fig. 3 Base of skull.

The sella turcica is wide, its floor partly eroded. In this region is a large tumor mass which has grown into the pharynx, orbits, and ethmoidal sinuses, and has destroyed the roof of the nose; the roof of the left orbit has been much more extensively invaded than the right. In the median line of the surface of the tumor exposed at the base of the skull after removing the brain is a projecting pedicle, darker than the tumor mass. This is found to be the infundibulum. It measures 3 mm. in diameter and is inserted into a round elevation 13x6 mm. of the same color as the stalk. The tumor itself is white on the surface, lobulated, the lobules 2 to 4 mm. wide, separated by narrow, but deep, fissures. On section the superficial part of the tumor is white and distinctly lobular. A gelatinous fluid exudes from the cut surface. Deeper down it is

more homogeneous and there is more slimy fluid. Still deeper dark red bands permeate it. The portion of the tumor removed with the hypophysis weighs 150 grams, but at least as much more was scooped out in pieces or left behind.

The brain weighs 1,540 grams. The distance from the frontal to the occipital pole is 18 cm.; transverse diameter, 14.5 cm. There is marked deformity of the left hemisphere to correspond with the obliteration of the anterior fossa of the skull. The left frontal lobe has been pressed upward and to the right. It termi-



Fig. 4 Anterior view of brain.

nates in a narrow strip along the median fissure. The lower end of the strip is 8 mm. above the pole of the right frontal lobe, its width 15 mm. at the base, 8 mm. at the lower end (see photograph). Farther to the left the brain substance has been compressed so that the inferior surface of the left frontal lobe is 3.5 cm. higher than that of the right side. The left temporo-sphenoidal lobe also is smaller and compressed; its inferior surface measures 1.5 cm. antero-posteriorly, while the right measures 3.7 cm. The convolutions of the brain are generally broad and flattened; the sulci shallow (see photograph). The left optic nerve is narrower than the right. The other cranial nerves appear symmetrical.

The length of the medulla and cord, from the pons to the filum terminale, is 60 cm. Below the mid-thoracic region are many thickened, partly calcified patches on the inside of the dura. These are rough and granular on the inner surface; the attached surface, on separation from the dura, is smooth. The largest of them measures 3x1.2 cm. To one of them a nerve-root is adherent.

The sternum is 26.5 cm. long, the greatest width of the manubrium 10.5 cm., of the body, 5.5 cm.

Histological Examination. The soft tumor. All parts of it



Fig. 5. Magnified 8 diameters. Showing relation of hypophysis to surrounding tissues, mostly tumor.

were subjected to examination, and its structure was found to be essentially the same everywhere. It is made up of cells, mostly spindle-shaped, with large oval or round nuclei. Karyokinetic figures are numerous. The protoplasm of the cells stains faintly. There is no suggestion of glandular or other epithelial structures, the cells having no definite arrangement. The texture is loose, there being a large amount of finely granular intercellular substance, stained lightly by hematoxylin. This is evidently in part the coagulated product of the abundant viscid material noted on gross examination. In the deeper part of the tumor the degenerative changes are more marked. There are large necrotic areas,

and also hemorrhages. The reason for the lobulated appearance of the surface is found in the presence of fibrous bands running perpendicularly to the surface. Such trabeculae are also seen in the deep portions. In places tumor cells, sometimes with karyokinetic figures, lie in them. In various parts, more particularly near the hypophysis, are bony spicules, some of which are rich in bone corpuscles, and probably newly formed. Here and there giant cells are seen. The tumor may be designated an osteoplastic sarcoma with edema and mucoid degeneration.



Fig. 6. Magnified 45 diameters. On one side of dura hypophysis tissue. On other side tumor with bony spicule.

The Hypophysis and its Relation to the Tumor. Serial sagittal sections^{*} were made of the lateral halves after a preliminary bisection through the infundibulum. A fibrous membrane (dura mater) was found separating the hypophysis from the tumor, the sharp border being plainly visible to the naked eye on account of the difference in staining. At one point on the left side the tumor and the hypophysis are in direct contact, but the border is sharp, and there are no transitional cell forms. Some enlargement of the

*The writer wishes to thank Messrs. Foreman, Jackol, and Darmer for valuable aid in this tedious work.

organ is present, the greatest length as seen in the sections being 20 mm. At this point it measures 8 mm. from above downwards. It appears flattened in all the sections. The histologic structure is essentially normal. There are the usual large, highly eosinophilic cells, arranged in elongated columns, or in clusters of about the size of renal glomeruli, and smaller cells with cytoplasm stained a faint blue with hematoxylin, and rounded nuclei, also with more or less glandular arrangement. In the extreme right portion of the anterior lobe this is the only cell type seen, and glandular ar-

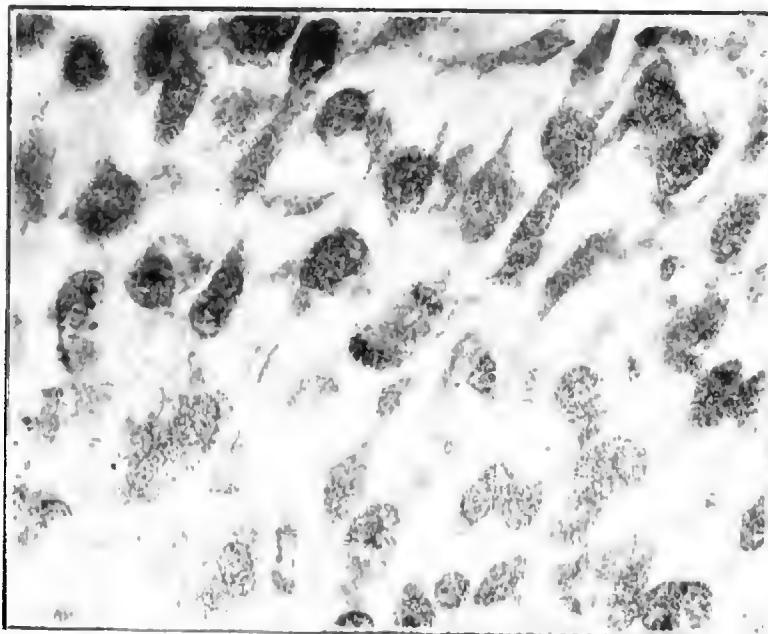


Fig. 7. Magnified 1,200 diameters. Showing finer structure of tumors. One mitotic figure in the center.

angement less apparent. There is a moderate number of spaces containing a colloid material and lined by epithelium. Engorged vessels are abundant. There are also numerous hemorrhages, a few foci consisting of densely-packed, small, round, deeply-stained mononuclear cells, an occasional amyloid body, and in places the large eosinophilic, epithelial cells are vacuolated. In places the trabeculae and adventitia of the small vessels have a hyaline appearance. There are generally deposits of pigment at the margin of such areas, indicating that they probably mark the site of old

hemorrhages. The posterior lobe is small and made up of a faintly fibrillar ground substance, stained lightly by hematoxylin, and containing a moderate number of long and narrow, deeply-stained nuclei; small vessels are numerous and engorged.

The Skull. Section from frontal bone in median line: Less than half the section is compact bone in irregular islands, the remainder a loose reticular tissue, consisting of a fibrillar unstained matrix with a small number of long, narrow, nucleated cells. At one edge of the specimen the interstices between the islands of

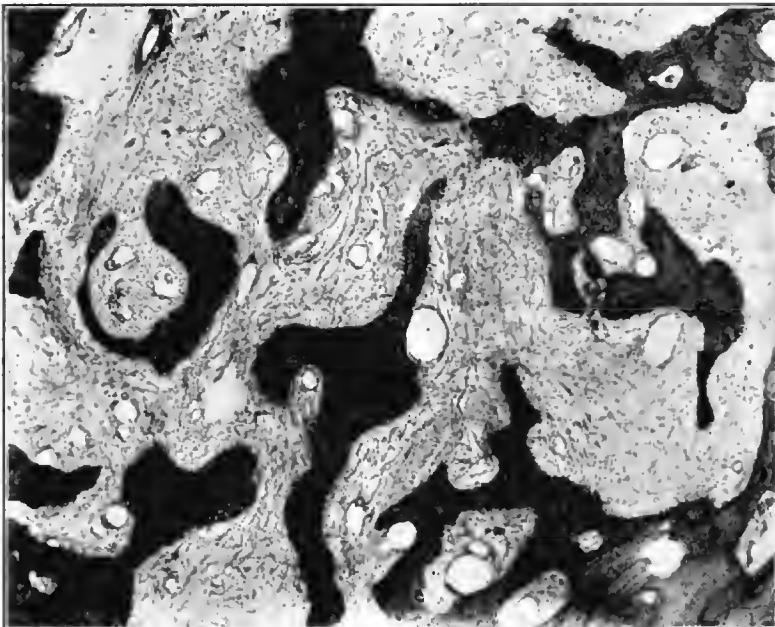


Fig. 8. Magnified 38 diameters. Frontal bone in median line.
bone are densely packed with spindle-cells like those in the soft tumor.

Left side of frontal bone near external surface: Here the compact bone is even smaller in amount, lamellæ imperfect. Haversian canals large and numerous. Most of the bone appears to be of recent formation judging from the number and size of the cells. Abundant osteoblasts are seen, mainly consisting of spindle-cells, with frequent mitotic figures. The texture of the tumor tissue in places is very loose, suggesting mucoid degeneration or edema.

Section from inner surface of frontal bone differs from the

preceding by the larger amount of deposits of new-formed bone, rich in cells, and taking a deeper hematoxylin stain than the old bone. They form small round or irregularly shaped bodies, lying together with spindle-cells, osteoblasts, and certain large, faintly-stained oval cells in the spaces bounded by trabeculae of old bone. In notches in the surface of the latter osteoclasts are occasionally seen. Right sphenoid bone. Here the bony trabeculae are also scarce, and enclose tumor tissue everywhere. In places are islands



Fig. 9. Left side of frontal bone, showing sarcomatous invasion.
of new-formed bone surrounded by osteoblasts and a few osteoclasts. Sections from a rib show nothing abnormal.

The ganglion cells of the cerebral cortex are practically normal. A few of them contain yellow pigment with lateral displacement of the nucleus. Marchi preparations of the cortex and subcortical white matter show no degeneration. There is a moderate amount of diffuse degeneration in the lower medulla and cervical cord. The roots are also slightly affected. In the cervical spinal ganglia a number of amyloid bodies are seen, the vessels of the capsule have thickened hyaline walls, a few of the small vessels contain thrombi. Many of the ganglion cells contain large masses of yellow pigment. The nuclei are distinct, generally centrally

located; their staining is very variable in intensity. There is some thickening of the smaller arteries in the lumbar region of the cord. The calcified patches in the spinal meninges are found to contain true bone. Both optic nerves are extensively degenerated, more so to the left, as seen in Marchi preparations.

Thyroid. The acini are generally distended with homogeneous colloid material. In places several acini appear to have coalesced. The blood vessels are few and small.

Lung. In a section from the lower lobe of one lung the alveoli are completely obliterated, so that it is difficult to recognize lung structure. In most places the lung tissue is replaced by round and elongated connective tissue cells. Here and there are considerable areas of blood which is partly in blood vessels and some apparently free in the tissues. The connective tissue is well organized into strands in places; in other places the organization has not gone so far. In one small area the alveolar walls may be made out, and the centers of the alveoli are filled with red blood corpuscles and leucocytes. Developing capillaries are seen in the tissue. These are filled with corpuscles. There are some pigment patches near the blood vessels. The pleura is thickened and greatly congested.

Heart. In sections of the heart muscle there is seen a very slight increase in interstitial tissue; otherwise there are no changes.

Spleen. The spleen is much congested, red corpuscles being diffused quite uniformly throughout the tissue. Malpighian corpuscles are clearly marked.

Lower Ileum. In sections examined, the mucosa is absent. The submucosa is greatly infiltrated with round cells. Blood vessels are congested, and in some places there is hemorrhage into the tissues. In places the submucosa has undergone necrotic change and sloughed away down nearly to the muscular layer. The circular layer of muscle fibers also is infiltrated with round cells and in many places there are blood vessels distended with blood. In the submucosa can be seen thrombi, consisting of layers of fibrin, between which are red and white corpuscles. Fibrin also is deposited in shreds throughout the submucosa.

Colon. The mucosa is much eroded in most places, and in some entirely absent. The surface is necrotic, so that only the lower parts of the glands are seen. The lumina of many of the glands contain mucous material. There is considerable round-cell infiltration. There is also hemorrhage into the tissues, and the vessels are greatly engorged. This condition extends also in the submucosa as far down as the muscular layer. Throughout the submucosa there are shreds of fibrin arranged usually in an ir-

regular network. Near the mucosa an amœba may be seen occasionally.

Rectum. The rectum presents much the same appearance as the colon, except that the condition is much more marked. The mucosa has undergone necrosis, and sloughing has occurred. There are large spaces near the surface, some of them filled with blood and fibrin; others are empty. In some places the blood is confined to blood vessels, but frequently it is diffuse. There are numerous round cells, some polymorphonuclear leucocytes, and plasma cells. Amœbæ are present in large numbers, most abundant in the upper part of the submucosa, but are also found in the other coats. They are usually spherical, but occasionally oval or oblong. They stain with eosin faintly. Usually the nucleus can not be seen, but frequently it is quite distinct, though not stained with hematoxylin. The amœbæ are invariably vacuolated. They are found mostly in the solid tissues, but occasionally may be seen in the blood vessels or large lymph spaces.

Liver. Interlobular connective tissue is increased in amount and distinctively isolates the liver lobules; this connective tissue does not extend into the lobules. The bile capillaries and blood vessels in this tissue show no changes. At the margins of the lobules the liver cells are not as distinct as elsewhere, and seem somewhat compressed. Elsewhere the liver cells are normal and the nuclei distinct. Occasionally fat vacuoles may be seen. The capsule of the liver is considerably thickened.

Pancreas. The pancreas shows no changes. Numerous areas of Langerhans are present.

Adrenals. There are a few areas of round-cell infiltration in the medulla and in the zona reticularis. Under the capsule in the cortex, there is seen congestion of the blood vessels.

Kidney. The glomeruli completely fill their capsules in most cases. Many of them are congested and show round-cell infiltration. The capsule is somewhat thickened. In places the capillaries between the tubules are much congested; there are also many round cells in places. The renal cells are large, cell walls distinct, and nuclei clear and distinct. In the tubules is seen a small amount of granular material. In some places the cells lining the tubules are slightly swollen and granular. Frequently clear spaces are seen around the nuclei. In other tubules the lining cells are low and flat, the nuclei stain deeply, and the lumen of the tubule is filled by a granular material.

Testicle. The seminiferous tubules show quite marked changes. Just inside the basement membrane the sustentacular and spermatogenic cells have undergone a hyaline change. In some tubules the hyaline change has advanced to the center, while in others the

hyaline area separates the normal cells from the basement membrane. Some tubules are apparently normal. There is some increase of fibrous tissue, and a few areas of round-cell infiltration.

A *bacteriological examination* was made by Mr. E. H. Ruediger of Rush Medical College, who kindly reported that no growth was obtained from the heart's blood, and that two organisms were isolated from the intestinal ulcers, one a typical colon bacillus, the other an unidentified bacillus, which possessed some characteristics both of the Shiga bacillus and the ordinary colon bacillus.

A *chemical examination* of the thyroid gland was made by Dr. H. G. Wells, who kindly furnished the following report:

"One-half of the gland was received in alcohol, with the statement that the gland was symmetrical. The tissue was ground up finely in a meat chopper, and to the ground material was added the alcohol in which the tissue had been preserved; the whole was then evaporated to dryness on the water bath, and then dried to a constant weight over sulphuric acid. The total weight of the dried gland so obtained was 13.80 grams, giving a total for the entire organ of approximately 27.60 grams. The normal weight of dried thyroid glands of residents of the United States has been found to be in the vicinity of 5 grams.* Portions of the dry powder were then analyzed by the modification of Baumann's method, and the average amount of iodin of four determinations found to be 2.28 mg. per gram of dried substance. The total amount of iodin in the entire gland was, therefore, 62.928 mg. Analysis of the glands of a series obtained in Chicago showed the average amount under normal conditions to vary from 1.5 to 2.5 mgs., with a total iodin content of about 10 mgs. Similar results were found with glands removed from residents of other parts of the United States. It is seen, therefore, that the gland of the giant contained a normal amount of iodin in each gram of gland substance, but on account of its greatly increased size the total amount was six times as much as normal.

"Histological examination of the gland explains fully the analytic results. It is seen that the enlargement is of the type of simple colloid goiter, characterized by large aveoli distended by a normal colloid material. It has been shown by Wells (*loc. cit.*) and corroborated by A. Oswald,** that in goiters as a rule the amount of iodin is in direct proportion to the amount of colloid. In the goiters of the "parenchymatous" type characterized by a great hyper-

*"The Physiology and Therapeutics of the Thyroid Gland and Its Con-genera." H. Gideon Wells, Journ. Amer. Med. Assoc., Act. 30, Nov. 6 and 13, 1897.

**A. Ostwald, Virchow's Archiv., 1902, 169, p. 444.

plasia of epithelial cells, and containing but little colloid, there is a marked decrease in the amount of iodin in each gram of gland, corresponding to the small amount of colloid, but the total amount of iodin is about normal because of the great size of the thyroid. On the contrary the glands of which this is a type show a colloid containing about normal quantities of iodin in each gram, and consequently with a greatly increased total amount. When the amount of colloid is very large Ostwald has found that part of it may not contain iodin. It seems possible that the parenchymatous goiters may be the result of a deficiency in supply of iodin in a condition to be transformed into thyroiodin, so that the gland hypertrophies in the effort, which is apparently successful, to obtain enough iodin for the requirements of the body. The colloid goiters may result from an increased requirement for thyroiodin in the economy, with normal supply of iodin, leading to the formation of much colloid with a normal proportion of iodin so long as the supply is adequate. That this giant, particularly with a diseased hypophysis, should have a large amount of iodin in his thyroid was to be expected and agrees with the theory. The result also shows that in this case of giantism the goiter was not different from simple goiter, at least so far as histology and iodin content indicate."

(*To be continued.*)

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